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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/046,926 | 01/13/2002 | Steven Teig | SPLX.P0085 | 3333 |
| 48947 | 7590 | 01/23/2006 | EXAMINER | |
| STATTLER, JOHANSEN, AND ADELI LLP 1875 CENTURY PARK EAST SUITE 1360 CENTURY CITY, CA 90067 | | | SIEK, VUTHE | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2825 | |

DATE MAILED: 01/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|------------------------|--|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/046,926 | TEIG ET AL. all | |
| | Examiner | Art Unit | |
| | Vuthe Siek | 2825 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 6-15, 21 and 22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 6-14, 21 and 22 is/are rejected.
- 7) ☒ Claim(s) 15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This office action is in response to application 10/046,926 and RCE with an amendment filed on 11/10/2005. Claims 6-15 and 21-22 remain pending in the application, where claims 1-5, 16-20 and 23-27 were canceled.

Claim Objections

2. Claims 8, 14 and 15 are objected to because of the following informalities: claim 8 step b), -- and-- should be inserted after "routes;"; claim 14 line 2, -- and-- should be inserted after "a length cost;"; claim 15 line 5, -- and-- should be inserted after "cost;"; in order to close each of the sentence. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 6-13, 21 and 22 are rejected under 35 U.S.C. 102(e) as being anticipated by Raspopovic et al. (6,260,183).

5. As to claims 6, 8, 21 and 22, Raspopovic et al. teach a method of defining global routes (described in sections IV, VI) for nets in an arbitrary region a circuit layout, where each net has a set of pins, (see abstract, summary, Figs. 2, 7, 8-10, 17-25 and its

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description; Fig. 21 shown each net has a set of pins) comprising using a first set of lines (meaning set of intersecting lines) to measure length of the global routes (at least see col. 27 lines 50-63, Raspopovic et al. teach routing graphs are constructed first and then utilizing them to perform global routing followed by detailed routing by taking account of congestion see Fig. 18; Fig. 23 shown routing graphs are obtained from sets of intersecting lines); using a second set of lines (meaning set of intersecting lines) to measure congestion of the global routes (col. 23 lines 23); using a third set of lines (meaning set of intersecting lines) to partition the arbitrary region into a first set of sub-regions (col. 23 lines 10-16; Figs. 6, 7, 10, 19, 23 shown partitioned sub-regions; Figs. 2, 8 describe partition large nets into smaller ones;); and for each net, identifying a global route that connects a group of first-set sub-regions that contain the net's set of pins (sections IV and VI describe global routing and hierarchical global routing; see also col. 26 lines 46-53; col. 32 lines 29-51).

6. As to claim 7, Figs. 19 and 23A-23B are examples of the routing graphs for global routing, where the routing graphs are obtained from grid lines. They are all intersecting lines and identical.

7. As to claim 9, Raspopovic et al. teach performing global routing and hierarchical global routing and then followed by detailed routing utilizing routing graphs (grid lines) as described in section IV, VI and VII in order minimize routing length, where the routing length is obtained by summing all grid lines used for routing (at least see col. 27 lines 1-15).

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8. As to claims 10-12, Raspopovic et al. teach measuring congestion (calculating capacities) of the global routes (at least see col. 23). Raspopovic et al. teach constructing timing graphs (grid lines) by partitioning a large net having large set of pins into smaller nets (subnets of course with smaller number of pins) as described earlier and then performing global routing, hierarchical global routing, followed by detailed routing utilizing the constructed routing graphs by taking congestion into account (col. 26 lines 46-53; col. 33 lines 32-62). The congestions or capacities are measured (Fig. 18, calculate capacities; see section IV; col. 23). Fig. 23A shows previous level of global routing and Fig. 23B shows current level of global. As shown in Fig. 23B, each line passes through or crossing the middle of a column or channel. This clearly suggests that once a global route is complete, each global route must be specified only with respect to the global route's segments that cross the congestion edges.

9. As to claim 13, Raspopovic et al. teach constructing timing graphs (grid lines) by partitioning a large net having large set of pins into smaller nets (subnets) as described earlier and then performing global routing, hierarchical global routing, followed by detailed routing utilizing the constructed routing graphs by taking congestion into account (col. 26 lines 46-53; col. 33 lines 32-62). The subnets (sub-regions for corresponding subnets, where each subnet having set of pins) are used to guide the routing the of net (col. 26 lines 48-63). When performing global routing and hierarchical global routing all nets passing through the subnet (See sections Iv & VI, col. 28 line 25 to col. 29 line 26). Fig. 23A shown routing graph used in previous level of global routing, where the global routing is complete by connecting all group of sub-regions that

contain the net's pins and Fig. 23B shown routing graph in current level of global routing.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Raspopovic et al. (6,260,183) in view of Jones et al. (5,875,117).

12. As to claim 14, Raspopovic et al. teach constructing timing graphs (grid lines) by partitioning a large net having large set of pins into smaller nets (subnets) as described earlier and then performing global routing, hierarchical global routing, followed by detailed routing utilizing the constructed routing graphs by taking congestion into account (col. 26 lines 46-53; col. 33 lines 32-62). The subnets (sub-regions for corresponding subnets, where each subnet having set of pins) are used to guide the routing the of net (col. 26 lines 48-63). When performing global routing and hierarchical global routing all nets passing through the subnet. Fig. 23A shown routing graph used in previous level of global routing and Fig. 23B shown routing graph in current level of global routing. Raspolovic et al. does teach optimizing routing (Fig. 24, col. 32). Although, congestion cost and routing cost are well known in the placement and routing of IC design, Raspolovic et al. does mention in his invention. Jones et al. teach

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placement & global routing of IC design using composite cost including congestion cost and wiring length cost in order to optimize placement and global routing to thereby providing compact and minimum wiring length of IC design (col. 32 lines 20-38; col. 41-42). In addition, these costs are used as metrics to measure and evaluate performance of the placement and routing in order to obtain an optimal solution. With these motivations, it would have been obvious to practitioners in the art to have included length cost and congestion cost as taught by Jones during performing global routing and hierarchical global routing as taught by Raspopovic et al. because these costs would enhance global routing and hierarchical global routing to thereby obtaining minimum routing length as expected.

Allowable Subject Matter

13. Claim 15 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art of record does not teach or fairly suggest specifying a first global route segment comprising examining a plurality of potential global route-segment expansions; wherein for cost potential global route-segment expansion, computing a length cost; and wherein if the potential global route-segment expansion intersects a second-set line, computing a congestion cost based on the congestion of the second-set line.

Remarks

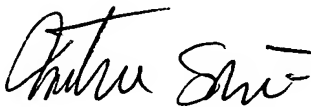
14. Examiner respectfully submits new ground of rejection because the invention pertained to a global routing.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vuthe Siek whose telephone number is (571) 272-1906. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Chiang can be reached on (571) 272-7483. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Vuthe Siek


VUTHE SIEK
PRIMARY EXAMINER